

Triaxial Fabrics

Most fabrics are woven with two sets of yarn intersecting at 90 degree angles; this is called biaxial weaving. The fabrics pictured in highly magnified blowups are triaxially woven from three separate yarn sets whose intersections form equilateral triangles, traditionally the strongest architectural structures. This type of weave assures practically equal strength in every direction; triaxially woven fabric has essentially no bias, or weak dimension, thus offers far greater resistance to tear and shear along with significant weight reduction.

The fabrics shown are typical of the Triax[™] line recently introduced by Gentex Corporation, Carbondale, Pennsylvania for applications requiring high strength-to-weight ratio and high material stability—for example, inflatable equipment such as life rafts, life vests, aircraft evacuation slides and helicopter flotation devices; tension structures, such as stadium roofs, and tear-resistant tents; safety clothing; and sailcloth for boats. Triax' ability to accept compound curvatures with no distortion of the weave configuration also makes it useful in manufacturing molded composites, such as diaphragms for emission control valves, air brakes for trucks and locomotives, or automotive and industrial belts. Gentex is initially using polyester, fiberglass and aramid fibers in production of Triax fabrics, but plans to add other fibers to the line.

The triaxial weave concept was invented by N. F. Doweave, Inc., formerly of King of Prussia, Pennsylvania but no longer in business. However, NASA sponsorship of advanced research in this field provided the impetus for development of currently available fabrics. Seeking fabrics of high dimensional stability for Space Shuttle pressure suits, Johnson Space Center contracted with Doweave for development of special materials. The Johnson/Doweave effort produced three promising fabrics. One of them, known as BP44P, became the basis for Gentex Corporation's further development and introduction of the Triax line.

Gentex weaving machinery is produced by Barber-Colman Company's Textile Machinery Division, Rockford, Illinois, which acquired sole manufacturing rights to Doweave's triaxial weaving equipment and further developed the machinery. At lower right is the Barber-Colman TW 2000 triaxial weaving machine, which is built in two models; one produces various fabrics in the Basic Weave shown at upper right, the other in the Bi-Plain Weave (center).

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